What is Claimed:

1. A non-blocking optical switch comprising:

a plurality of ports wherein each port has an optical input for receipt of an incident beam and an optical output from which a switched beam can exit;

a plurality of multi-state switchable beam deflecting elements wherein the elements exhibit a deflecting condition and a non-deflecting condition and wherein a transmission path is establishable between first and second ports in a selected direction and between the same two ports in an opposite direction and wherein the path is established in at least one of a waveguide, free space and optical fiber.

2. A switch as in claim 1 which includes a plurality of deflecting only elements for bounding in part a transmission path associated with each of the ports.

3. A switch as in claim 2 wherein transmission paths are bounded in part by at least a multi-state element and a deflecting only element.

4. A switch as in claim 1 wherein at least some of the ports have an associated deflecting only element.

5. A switch as in claim 4 wherein some of the ports have one or more associated multi-state deflecting elements.

6. A switch as in claim 1 which includes at least first and second pairs of ports with each pair configured so as to have at least one transmission path having substantially a common predetermined length.

7. A switch as in claim 2 wherein at least selected of the deflecting only elements define a transmission path back to a respective port.

8. A switch as in claim 7 wherein the selected elements reflect an incident light beam back to the respective port along the transmission path.

9. A switch as in claim 1 wherein the number of multi-state elements is on the order of one-half the difference of the number of ports squared minus one.

10. A switch as in claim 1 wherein at least some of the multi-state elements comprise switchable mirrors.

11. A switch as in claim 1 wherein the ports are staggered relative to one another and wherein selected pairs of ports exhibit a common path length.

12. A switch as in claim 1 wherein the ports are staggered relative to one another and including at least one optical reversing element associated with at least one of the ports for providing a bidirectional transmission path to and from the respective port.

13. A switch as in claim 12 wherein selected pairs of ports exhibit a common path length and wherein a length of the bidirectional path is substantially the same as the common path length.

14. A switch as in claim 1 which includes control circuits for switching the multi-state elements.

15. A switch as in claim 1 wherein the multi-state elements comprise at least one of switchable reflectors, optical bubbles and holographic gratings.

16. A switch as in claim 15 wherein the switchable reflectors include movable mirrors.

17. A switch as in claim 15 wherein the switchable reflectors each include a mirror and a mechanically switching element movable relative to the mirror.

18. A switch as in claim 1 wherein the multi-state elements are selected from a class which includes switchable mirrors and solid state beam deflectors.

19. A switch as in claim 1 which includes at least one multi-state element and one deflecting only element in each possible path in the switch.

20. A switch as in claim 1 which has N inputs and wherein the plurality of switchable deflecting elements comprises [N*(N-1)/2]-1 elements.

21. A switch as in claim 20 wherein the deflecting elements are configured so as to provide transmission paths having substantially a common predetermined length.

22. A switch as in claim 20 wherein some of the transmission paths comprise a loop-back function.

23. A switch as in claim 20 which comprises N outputs co-located with the N inputs.

24. A switch as in claim 23 wherein some of the transmission paths comprise a loop-back function.

25. An optical switch comprising:

a plurality of bidirectional optical ports coupled to a switching region;

a plurality of fixed reflectors and switchable deflectors arranged within the region to support reciprocal traffic with respect to selected pairs of ports wherein the number of switchable deflectors comprises [N*(N-1)/2]-1 for N ports..

26. An optical switch as in claim 25 wherein the ports are configured, relative to the switching region, such that selected pairs of ports exhibit communications paths in the region which have substantially a common path length.

27. An optical switch as in claim 25 wherein some of the ports have an associated fixed deflector to implement a loopback function at the selected ports.

28. An optical switch as in claim 25 wherein the switchable deflectors are selected from a class which includes electro-mechanical switching elements and solid state switching elements.

29. An optical switch as in claim 28 wherein the region is bounded by a housing which carries the ports and wherein control circuitry is coupled to the switchable deflectors.

30. A method of switching optical signals to and from a plurality of bidirectional ports comprising:

injecting input signals from a pair of ports into a switching region;

arranging in the region switchable optical deflectors on the order of one-half the square of the number of ports in the plurality; and

deflecting the input signals, using a common path, to become output signals for the other of the ports in the pair using at least some of the deflectors.

31. A method as in claim 30 which includes staggering the ports so that each path of a selected pair of paths, has a common length.

32. A method as in claim 31 wherein each path is associated with a respective pair of ports.

33. A method as in claim 30 which includes providing a loop-back function for some of the ports.

34. A method as in claim 30 which includes coupling incoming optical signals to respective of the ports.

35. A method as in claim 30 which includes establishing a plurality of communication paths using the optical deflectors.

36. A method as in claim 35 which includes configuring the ports and the deflectors such that the paths exhibit substantially a common length.

37. A method as in claim 35 wherein the deflectors are configures to comprise [N*(N-1)/2]-1 for N ports.

38. A modular optical switch which includes a plurality of substantially identical switch modules for reciprocal traffic wherein each module is non-blocking and includes:

a plurality of ports wherein each port can receive an incident beam and can emit a switched beam;

a plurality of multi-state beam deflecting elements wherein the elements exhibit a deflecting condition and a non-deflecting condition and wherein a transmission path is establishable between first and second ports in a selected direction and between the same two ports in an opposite direction.

39. A switch as in claim 38 which has a first, multi-module stage wherein a plurality of ports therein support reciprocal traffic and wherein each module provides a selected switching function; and

a second stage which comprises the plurality of switch modules wherein each of the switch modules is interconnected with members of the first stage.

40. A switch as in claim 39 wherein the plurality of beam deflecting elements for an N-port module comprises [N*(N-1)/2]-1.

41. A switch as in claim 39 wherein pairs of ports of the switch modules are configured to have a common optical transmission length within the respective module.

42. A switch as in claim 38 wherein the elements are selected from a class which includes optical deflecting bubbles, holographic gratings, solid state deflectors, and movable deflectors.

43. A switch as in claim 38 wherein intra-module beam transmission paths comprise at least one of free space, optical fibers and waveguides.